DOCUMENT RESUME

ED 268 500 CS 008 394

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TITLE Student-Generated Paragraph Summaries and the Information-Processing Theory of Prose Learning.
PUB DATE Apr 86
NOTE 11p.; Paper presented at the Annual Meeting of the American Educational Research Association (70th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Processes; Higher Education; *Learning Processes; Learning Theories; *Paragraphs; Prose; Reading Ability; Reading Comprehension; *Reading Research; Study Skills
IDENTIFIERS *Blooms Taxonomy; Prose Learning; *Summarization

ABSTRACT

A study investigated the relationship between high and low reading ability and the study techniques of reading, the usual method of note taking, and student-generated paragraph summaries on the six levels of cognitive learning from textual material as measured by Bloom's "Taxonomy." Subjects, 84 college students enrolled in an educational psychology course, participated in three experimental sessions. Students took the comprehension section of the Nelson-Denny Reading Test in order to assess their reading during the first session. In the second session, students received a packet of material also containing instructions for the study technique the student was to use, were given 30 minutes to learn the text, and were tested in a third session one week later. Students who wrote paragraph summaries scored higher than students who read or took notes at the application and analysis levels, although students who read or took notes scored higher at the syntheses and evaluation levels. The information-processing theory provides an explanation for this, since questions at the knowledge and comprehension levels require answering information in the same form in which it was provided. Therefore, it may be concluded that the use of paragraph summaries has a positive effect at some levels of learning. (DF)

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Student-Generated Paragraph Summaries and the Information-Processing Theory of Prose Learning

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Paper presented at the Annual Meetings of the American Educational Research Association, San Francisco, April, 1986.

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The information-processing theory of learning is used to explain the cognitive processes of learners as they engage in prose learning. This theory (e.g., Gage & Berliner, 1984) involves the three essential steps of directing attention to the material that is to be learned, encoding the material into a personally meaningful form, and then associating the new material to what the learner already knows, Annis (1983) recommended the use of a study technique referred to as student-generated paragraph summaries which appears to meet the demands of the information-processing theory. This paragraph summary method requires students to pause after reading each paragraph of text in order to write a brief sentence or less summary in their own words. The information-processing model provides an effective way to analyze the potentially useful elements of paragraph summaries as well as to indirectly test the correctness of the model.

Doctorow, Wittrock, and Marks (1978) provided the only previous investigation of paragraph summaries. Sixth-grade students were asked to read stories using one of four treatment conditions. These four treatments assigned students to either read a story with an inserted heading provided above each paragraph, to generate their own sentence about each paragraph, to read a story with inserted headings provided for each paragraph as well as to generate their own sentence for each paragraph, or to just read the same story. It was found that the combination of inserted paragraph headings and instructions to generate sentences about paragraphs approximately doubled scores on measures of both immediate comprehension and delayed recall. This most effective treatment was followed in turn by generating sentences,

insertion of paragraph headings, and finally by reading the same stories without generative instructions or paragraph headings.

The Doctorow, et al. study provides interesting insights regarding the facilitation of the encoding and associative processes of learning, but many questions remain to be answered. First, their study was concerned with sixth graders and the impact on older students needs to be determined. Second, the paragraph headings treatment in this study depends on other people providing the heading which is not always realistic. Paragraph summaries appear to be more practical for further investigation. Also, the Doctorow, et al. generative treatment condition instructions required the students to write a complete sentence in their own words which may be unnecessarily restrictive.

Doctorow, et al. also investigated the possibility that reading ability affects students' ability to generate their own text elaborations. They found that both high- and low-ability readers learned more when asked to generate summaries of the text rather than just read only, but the generative instructions facilitated learning most for the low-ability readers. The comprehension scores of the low-ability readers also were enhanced more by generative instructions than by inserted paragraph headings. It thus appears that low-ability readers may not be able to spontaneously generate their own version of the text as readily as high-ability readers. However, since different reading and test materials were used for students with high and low reading ability, it was not possible to make a definitive statement about the effect of reading ability and generative instructions on learning. In contrast, the present study used the same reading and test materials for all students, and reading ability was used as an independent

variable.

Finally, Mayer (1979) has argued that a measure of the total amount of learning from textual material is not appropriate since the type of information acquired by individual learners under specific treatments can vary without significantly changing the overall amount of learning. Thus there is a need for dependent measures which reflect differential learning of various types of textual material. Bloom's Taxonomy (1956) provides a classification of six hierarchical levels of learning which was used to test the effect of the characteristics of individual learners and learning situations on specific learning outcomes.

Thus, the purpose of this study was to investigate the relationship between high- and low-reading ability and the study techniques of reading only, usual method of note taking, and student-generated paragraph summaries on the six levels of cognitive learning from textual material as measured by Bloom's Taxonomy.

Subjects were 84 college students enrolled in an educational psychology course. The study was conducted over three experimental sessions. During the first session, each student took the Comprehension section of the Nelson-Denny Reading Test (1976) in order to assess their reading ability. Students scoring at or above the median raw score of 17 were classified as high-ability readers, and students scoring below 17 were classified as low-ability readers.

In the second experimental session all students received a randomly assigned packet of material. Each packet contained instructions for

either reading only, taking notes on the learning material in their usual way, or generating paragraph summaries over a 1525-word article entitled "The Lisbon Earthquake" (Kropp, Stoker, & Bashaw, 1966). The students assigned to the read only treatment condition were asked to read through the article without taking any notes. The students in the note-taking treatment were asked to take notes over the article in their usual way. The students in the generating paragraph summaries treatment were instructed to stop reading and to write their own brief summary of the main ideas in the paragraph in their own words in a sentence or less in the blank space above each paragraph of the article which was the same format used by Doctorow, et al. Students in all three treatment groups had 30 minutes to learn the text.

One week later an examination consisting of 48 possible points was given. There were eight multiple-choice questions worth one point each at the Knowledge-Analysis levels of Bloom, and essay questions worth a total of eight points each at the Synthesis and Evaluation levels. The test questions also were from Kropp, et al. (1966) who empirically determined that their classification of test items agreed with the Bloom classification.

Six treatment conditions resulted from the two independent variables of reading ability (high or low) and study technique used (reading only, usual note-taking method, student-generated paragraph summaries). Six dependent variables were used: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. A 2 X 3 (reading Ability X Study

Technique) unequal cell, multivariate analysis of variance was performed on the data for the 84 students.

This analysis indicated a significant main effect for treatment (F (12, 146) = 4.93, $p < .0001$). Separate univariate analyses were conducted for each of the six dependent variables. The univariate analyses for Knowledge and Comprehension scores were not significant. However, the univariate analysis for Application indicated a significant effect for treatment (F (2, 78) = 2.97, $p < .05$). The mean Application scores were 4.33 for Read, 4.85 for Notes, and 5.25 for Paragraph Summaries (PS). A post hoc Newman-Keuls test indicated that students who wrote PS scored significantly higher ($p < .05$) than students who Read. The univariate analysis for Analysis scores indicated there was a significant effect for treatment (F (2, 78) = 2.44, $p < .1$). The mean scores were 4.55 for Notes, 5.00 for Read, and 5.42 for PS. A post hoc Newman-Keuls test indicated that the only significant difference ($p < .05$) was that PS students scored higher than students who took Notes.

The univariate analysis for Synthesis indicated there was a significant effect for treatment (F (2, 78) = 17.64, $p < .0001$). The mean scores were 2.04 for PS, 4.42 for Read, and 4.59 for Notes. A post hoc Newman-Keuls test revealed that both the Read and Notes students scored significantly higher ($p < .01$) than students who used PS. Finally, there was a signficant effect for Evaluation scores (F (2, 78) = 5.27, $p < .01$). The mean Evaluation scores were 1.75 for PS, 3.70 for Notes, and 3.79 for Read. A post hoc Newman-Keuls test revealed that both the Read and Notes students scored significantly higher ($p < .01$) than the PS students.

The multivariate analysis of variance also indicated a significant main effect for Reading Ability (F (6, 73) = 2.89, $p < .01$), but there was no significant main effect for the interaction of Reading Ability and Study Technique. Separate univariate analyses were conducted for each of the six dependent variables. The univariate analyses for Comprehension and Synthesis were not significant. However, the univariate analysis for Knowledge indicated a significant effect for Reading Ability (F (6, 73) = 5.26, $p < .05$). High ability readers (6.38) scored higher than Low ability readers (5.67).

The univariate analysis for Application indicated a significant effect for Reading Ability (F (6,73) = 8.16, $p < .01$). The mean scores were 5.15 for High ability readers and 4.27 for Low ability readers. The univariate analysis for Analysis scores indicated a significant effect for Reading Ability (F (6, 72) = 5.69, $p < .05$). The mean Analysis scores were 5.30 for High ability readers and 4.57 for Low ability readers. Finally, there was a significant univariate effect for Evaluation scores (F (6, 73) = 8.03, $p < .01$). The mean scores were 3.87 for High ability readers and 2.30 for Low ability readers.

The results for the three treatments at the various levels of Bloom's Taxonomy were most interesting. There was no significant effect for treatment at the two lower levels of Knowledge and Comprehension. However, students who wrote PS scored higher than both the students who Read or took Notes at the Application and Analysis levels. But at the Synthesis and Evaluation levels students who Read or took Notes scored significantly higher than students who used PS. The information-processing theory

provides a possible explanation for these results. Since the Knowledge and Comprehension levels of questions basically require answering questions using information in the same form in which it was provided, all study methods, as was the case in this study, that require some amount of attention to the material may be somewhat equally effective.

The effect of the particular study method used becomes more apparent at higher levels of questions. At the Application and Analysis levels, which require students to apply material to new situations and to judge how the material is interrelated, the PS technique was superior to the other two. This may result from the fact that the PS students were required to stop at the end of each paragraph and put the essential information into their own words, the important encoding step of the information-processing theory. This process facilitated their ability to see how the new material could be applied in actual situations and how it was related to other parts of what they had read. In contrast, the Read students never were forced to encode the information as they took no notes. The Notes students were able to decide when to take notes and this may have resulted in more sporadic note taking and hence less consistent encoding. This was reflected in their numerically lower Application scores and significantly lower Application scores.

The most surprising result was the significantly lower Synthesis and Evaluation scores for the PS students, especially after they scored the highest at the two preceding levels of Application and Analysis. Perhaps the explanation lies in the last associative linkage stage of the information-processing theory. It may be that the PS students were required

by the time demands of the 30 minutes to focus all their efforts on writing the required encoded notes for each paragraph. Thus they had no time or possibly motivation to try to associate the new material to what they already knew. In contrast, the Read and Note takers more evenly divided their time and effort among the three information-processing stages of paying attention, encoding, and association. Thus the Read and Note students scored about the same as the PS students at the Knowlwedge and Comprehension levels. They did not score as well as the PS students at the Application and Analysis levels because they did not focus their efforts as extensively on the encoding process. Finally, the Read and Notes students scored better on the highest two levels of Synthesis and Evaluation because they had enough study time left to relate the material and to make judgments about it, processes which are related to associative linkages.

The present study and Doctorow, et al. agree in finding a positive effect for PS at least at some levels of learning. The Doctorow, et al. study concluded that generative instructions generally facilitate learning and were especially useful with low-reading ability learners. By using measures of learning at the various levels of Bloom and by analyzing the benefits of paragraph summaries in terms of the information-processing theory of learning, it appears that paragraph summaries may be most useful in encouraging the essential encoding process. Thus paragraph summaries appear to be a potentially powerful theoretically-based study technique with the added advantage that students can generate their own paragraph summaries independently of the instructor or author.

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